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Australian Standard®

Measurement of drift loss from cooling towers

Part 1: Chloride balance method

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The following are represented on Committee ME-062:

- Airconditioning and Refrigeration Equipment Manufacturers Association of Australia
- Australian Building Codes Board
- Australian Medical Association
- Chartered Institution of Building Services Engineers
- Plastics and Chemicals Industries Association Incorporated

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Part 1: Chloride balance method

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PREFACE

This Standard was prepared by the Standards Australia Committee ME-062, Mechanical Ventilation and Airconditioning.

The objective of this Standard is to provide a testing method that manufacturers may use for product development and to substantiate drift loss performance claims.

Work on the first edition of this Standard was originated in 1990 following the publication of AS 3666—1989, *Air-handling and water systems of buildings—Microbial control*. That Standard set a maximum acceptable level of drift as a percentage of the design water circulation rate.

In preparing this Standard, Committee ME-062 considered an Australian test method (chloride balance method) and two international testing methods (heated bead isokinetic method and thermal balance method), which were assessed as being acceptable. The chloride balance method is described in this Standard.

This Standard is the first of two parts dealing with cooling tower drift loss measurement as follows:

AS		
4180	Measurement of drift loss from cooling towers	
4180.1	Part 1:	Chloride balance method (this Standard)
4180.2	Part 2:	Lost chloride method

The terms 'normative' and 'informative' have been used in this Standard to define the application of the appendix to which they apply. A 'normative' appendix is an integral part of a Standard, whereas an 'informative' appendix is only for information and guidance.

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FOREWORD

Cooling towers are devices commonly used to dissipate heat from water-cooled refrigeration, airconditioning and industrial processes. Atmospheric air passes through sprayed water, thereby exchanging heat and, mostly by an evaporative process, lowering the water temperature. Similar heat rejection devices are called evaporative condensers, industrial fluid coolers or, in some industrial settings, wet surface air coolers. They have been refined to be highly efficient in operation and are a significant factor in the achievement of energy efficient buildings in Australia, thereby helping to reduce global warming, in contrast to other means of rejecting heat.

The evaporation that takes place produces a plume that is often visible. The density and persistency of the plume depend upon the heat load and atmospheric conditions. The plume may be visible as fog because of its elevated temperature and high moisture content relative to the prevailing weather; the ambient air is unable to absorb all the water vapour in the tower discharge airstream and the excess condenses as fog.

Condensation droplets formed from this water vapour (steam) will be essentially pure water.

In addition, droplets are formed within the cooling tower as a result of drops of water falling onto the components within the tower and shattering. As it passes through the tower, the airstream may entrain some droplets. Most of this water is stripped from the discharge airstream by elimination methods, most notably the use of inertial impaction separators known as drift eliminators. (Sometimes the assembly is known as a drift eliminator.) Some water may be discharged from the tower as a mist of fine droplets.

The rate of drift loss is a function of the tower configuration, the eliminator design, the airflow rate through the tower and the water load on the tower.

Drift eliminators have evolved from simple timber slats arranged in a labyrinth to more complex arrangements constructed from thermoformed-UPVC sheets. The latter are commercially available (also as retrofit items) and are designed to perform very efficiently.

Because drift contains essentially the same minerals, chemicals and microbial content as the recirculating water, atmospheric quality is improved when drift loss is reduced. Test methods need to distinguish between water droplets formed as drift and water droplets resulting from recondensation of evaporated water as part of the thermal process.

It is clear that the reduction of drift emitted from heat rejection devices plays a key role in reducing public health risk. For drift eliminators to function effectively, however, in the way they are designed to function, it is essential that they be correctly operated and maintained at all times.

Part 1 of this Standard (this Part) describes the chloride balance method (CBM), a test method based on adding a known quantity of salt (sodium chloride), in the form of a solution, to a recirculating system. Any drift will contain such salt. The test method is judged to be suitable for laboratory applications only.

A similar technique, known as the lost chloride method (LCM), is described in Part 2 of this Standard and is judged to be suitable for field applications. The method involves indirectly measuring chloride loss over a period of time while also measuring direct usage of water by an operating system without heat load applied.

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Another drift loss test method, not described in this Standard, is known as the heated bead isokinetic (HBIK) method. It is well established in the USA and has been used successfully in Australia. It is judged to be suitable for either laboratory or field use. In the UK, a method known as the thermal balance method is described in British Standard BS 4485-2, *Water cooling towers—Methods for performance testing.* Experience in the use of the British test in Australia is lacking.

Other test methods may come into use as manufacturers and legislators seek to improve the role cooling towers play in the environment; care needs to be taken to ensure that only accredited organizations carry out the tests based on these alternative methods.

While various methods of drift elimination are now available, the performance data considered to be acceptable in any particular case is a matter for agreement between the equipment supplier and the purchaser. All techniques involve measuring quantities that are only finely differentiated; a high degree of accuracy, and close tolerances of measurement are needed to ensure that the test results are repeatable.

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STANDARDS AUSTRALIA

Australian Standard
Measurement of drift loss from cooling towers

Part 1: Chloride balance method

1 SCOPE

This Standard sets out the requirements for measuring the drift of circulating water into the atmosphere by a chloride ion mass balance on the water circuit, under laboratory conditions.

2 APPLICATION

The test applies to water circuits in direct contact with the atmosphere.

NOTE: The method measures the sum of all drift and any leakage losses.

3 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS		
2093	Salt for use in the manufacture of dairy products	
2360	Measurement of fluid flow in closed conduits	
2360.1.1	Part 1.1:	Pressure differential methods—Measurement using orifice plates, nozzles or Venturi tubes—Conduits with diameters from 50 mm to 1200 mm
2360.1.2	Part 1.2:	Pressure differential methods—Measurement using orifice plates or nozzles—Conduits with diameters less than 50 mm
2360.1.3	Part 1.3:	Pressure differential methods—Measurement using orifice plates, nozzles or Venturi tubes—Guide to the use of methods specified in Parts 1.1 and 1.2
2360.1.4	Part 1.4:	Pressure differential methods—Measurement using orifice plates, nozzles or Venturi tubes—Guide to the effect of departure from the conditions specified in Part 1.1
AS/NZS		
2031	Selection of containers and preservation of water samples for microbiological analysis	
ISO		
6227	Chemical products for industrial use—General method for determination of chloride ions—Potentiometric method	

4 DEFINITIONS

For the purpose of this Standard, the definitions below apply.

4.1 Circulating water temperature

The Celsius temperature of the circulating water measured in the cold water basin.

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